



Heriot-Watt University
Research Gateway

The role of iconicity in the evolution of linguistic structure

Citation for published version:

Santiago, J, Tamariz, M, Vigliocco, G & Vinson, D 2014, The role of iconicity in the evolution of linguistic structure. in E Cartmill, S Roberts, H Lyn & H Cornish (eds), *Proceedings of the 10th International Conference on the Evolution of Language*. World Scientific Publishing, 10th International Conference on the Evolution of Language, Vienna, Austria, 14/04/14.

Link:

[Link to publication record in Heriot-Watt Research Portal](#)

Published In:

Proceedings of the 10th International Conference on the Evolution of Language

General rights

Copyright for the publications made accessible via Heriot-Watt Research Portal is retained by the author(s) and / or other copyright owners and it is a condition of accessing these publications that users recognise and abide by the legal requirements associated with these rights.

Take down policy

Heriot-Watt University has made every reasonable effort to ensure that the content in Heriot-Watt Research Portal complies with UK legislation. If you believe that the public display of this file breaches copyright please contact open.access@hw.ac.uk providing details, and we will remove access to the work immediately and investigate your claim.

THE ROLE OF ICONICITY IN THE EVOLUTION OF LINGUISTIC STRUCTURE

MÓNICA TAMARIZ¹, GABRIELLA VIGLIOCCO², DAVID VINSON², JULIO SANTIAGO³

(1) PPLS, The University of Edinburgh, 3 Charles Street, Edinburgh EH8, UK.

(2) Psychology, UCL, 26 Bedford Way, London WC1H 0AP, UK.

(3) Psicología, U. de Granada, Campus de Cartuja s/n, 18012 Granada, Spain.

monica@ling.ed.ac.uk, {g.vigliocco, d.vinson}@ucl.ac.uk, santiago@ugr.es

Linguistic structure is a complex adaptive system subject to multiple constraints, from cognitive biases to social factors (Beckner et al., 2009). Meaning structure is one such constraint: the structure of linguistic forms mirrors, to some extent, the structure of meanings (Perniss et al., 2010). An experimental tool to reveal the effect of biases on linguistic structure is Iterated Learning (Kirby et al., 2008). In this paradigm, artificial languages are transmitted along chains of learners (like in the Chinese whispers game). In Kirby et al. (2008), initially random languages gradually became structured: meaning categories were systematically represented by regularities in the corresponding linguistic forms. Thus, items within a category (e.g. all red objects) had similar linguistic labels (e.g. all start with "po"), while items in different categories (e.g. red versus black objects) had distinct labels.

We adapted Kirby et al.'s paradigm to explore whether *physical properties* of meaning categories could also come to be mirrored by properties of the linguistic forms, in this case *iconically*. For this purpose we included in our meaning structure the spiky-round distinction, known to have iconically motivated representations (see Cuskley, 2012 for discussion). We hypothesized that the linguistic labels for spiky objects would not only become distinct from those for round objects, but they would additionally be perceived by independent raters as more *appropriate* for spiky objects (and the opposite for round objects and their labels), thus providing evidence for the emergence of iconicity. Further, we investigated this under two transmission conditions -- learning only versus learning plus communicative usage-- to see whether communicative usage would enhance or mask the effects of an iconicity bias.

We used artificial languages that designated twelve objects (6 rounded, 6 spiky; 3 red, 3 green and 3 blue; 6 with and 6 without a black border). The labels

were neutral in terms of spikiness/roundedness, as measured with an ancillary norming study. And the initial languages showed no significant systematicity. As far as transmission is concerned, the *learning* condition was modeled on Kirby et al. (2008): one participant was trained and then tested on a language and her output was the training language for the next participant. The *communication* condition followed Tamariz et al. (2012): two participants sitting at separate computers were trained on a language, and then used it to play a communicative game. The labels produced by one of the players constituted the training language for the next pair. We ran four chains of six generations in each condition. We measured the systematicity (Mantel test, as in Kirby et al. 2008) and the iconicity (with a Likert-scale norming study: people rated how good each label was for a spiky/rounded object).

We found that overall systematic structure increased over generations, as in previous studies. Crucially, the emergent mappings between labels and shape were iconic, with labels for spiky objects being rated as more "spiky" by independent raters than labels for round objects. And these effects were significantly stronger in the communication than the learning condition. Understanding why language is the way it is involves understanding the action of all the constraints that act upon it. The present results suggest that our participants shared a bias for iconicity (in our case, to iconically associate spikiness and roundedness with certain letters), which had a measurable effect on language structure; additionally, we found that the emergent iconic mappings can not only be learned and reproduced, but also maintained and enhanced over communicative interactions.

References

- Beckner, C., Blythe, R., Bybee, J., Christiansen, M.H., Croft, W., Ellis, N.C., Holland, J., Ke, J., Larsen-Freeman, D., Schoenemann, T. (2009). Language is a complex adaptive system: position paper. *Language Learning* 59:Suppl: 1–261.
- Cuskley, C. (2012). *Shared cross-modal associations and the emergence of the lexicon*. PhD thesis, The University of Edinburgh.
- Kirby, S., Cornish, H., & Smith, K. (2008). Cumulative cultural evolution in the laboratory. *PNAS*, 105(31): 10681-10686.
- Perniss, P., Thompson, R.L. & Vigliocco, G. (2010). Iconicity as a general property of language: evidence from spoken and signed languages. *Frontiers in Psychology*, 1, 227.
- Tamariz, M., Cornish, H., Roberts, S. & Kirby, S. (2012). How generation turnover and interlocutor negotiation affect language evolution. In T. Scott-Phillips, M. Tamariz & E. Cartmill, (Eds.) *The Evolution of Language*. Proceedings of the 9th International Conference on the Evolution of Language.